CLAIMS in AMENDMENT

[On January 31, 2000 (31.01.00) in receipt by the international bureau: claim 4 at the time of filing the present application was withdrawn; claims 1, 5, 6, and 8 to 10 at the time of filing the present application were corrected; the other claims are unchanged. (3 pages)]

1.   A carrier reproducing method of a PSK modulated signal, comprising steps of:

synchronously detecting the PSK modulated signals with a reproducing carrier signal from an oscillator to create a synchronous detecting signal;

phase-detecting said synchronous detecting signal to create a phase detecting signal;

creating an auto-correlation function output taken over a predetermined time interval (TMCC period) on said phase detecting signal; and

applying a control signal based on a period of said auto-correlation function output to said oscillator to make a reproducing control signal from said oscillator synchronize with a carrier of the PSK modulated signal,

characterized in that a phase rotation of a predetermined angular velocity (α) which is larger than a maximum expected alienation frequency of said oscillator with respect to the carrier frequency to said phase detecting signal so that on the phase detecting signal to which said phase rotation is given, the

auto-correlation function output taken over said predetermined period is created.

2. The carrier reproducing method according to claim 1, characterized in that said synchronous detecting signal is a signal point arrangement conversion signal obtained by multiply-detecting said reproducing carrier signal and the PSK modulated signal to create I, Q signals and implementing a signal point arrangement conversion for said I, Q signals, and the phase rotation of a predetermined angular velocity (α) to said phase detecting signal is a phase-rotation of the predetermined angular velocity (α) taken for said signal point arrangement conversion signal.

3. The carrier reproducing method according to claim 1 or 2, characterized in that said control signal having a polarity is created from a value derived by subtracting said predetermined angular velocity (α) from an angular velocity ($\omega+\alpha$) corresponding with a period of said auto-correlation function.

4. The carrier reproducing method according to claim 1, characterized in that a period (T) corresponding with a difference between said predetermined angular velocity (α) and a maximum one of said expected alienation frequency is selected so as to become smaller than a predetermined time interval taking said correlation.

5. The carrier reproducing method according to any one of claims 1 to 4, characterized in that said predetermined angular velocity (α) is an α having positive polarity or negative polarity.

6. The carrier reproducing method according to claim 2, characterized in that said I, Q signals are inputted and a predetermined time interval width taking said auto-correlation is determined from said I, Q signals.

7. A *synchronous detecting apparatus* carrier reproducing method of a PSK modulated signal, comprising:

an oscillator (NCO) for outputting a reproducing carrier signal;

a synchronous detection circuits (1, 3) for synchronously-detecting a reception PSK modulated signal with said reproducing carrier signal to create I, Q signals;

a signal point arrangement converting circuit (5) for implementing a signal point arrangement conversion on said I, Q signals to create a signal point arrangement conversion signal;

a phase detecting circuit (6) for phase-detecting said signal point arrangement conversion signal to create a phase detecting signal; and

an auto-correlation detection circuit (7) for taking an auto-correlation over a predetermined time interval on said phase detecting signals to produce an auto-correlation function output and for giving to said oscillator a signal based on the auto-correlation function output to control an oscillation frequency of said oscillator,

characterized by a phase rotation circuit (8) for causing said signal point arrangement signal to phase-rotate by a predetermined angular velocity (α) which is larger than a maximum expected alienation frequency of said oscillator with respect to a carrier

5 frequency.

8. The synchronous detecting apparatus according to claim 7, further comprising a subtracting circuit (9) for subtracting a value corresponding with said predetermined angular velocity from a signal

10 based on said auto-correlation function output.

9. In the carrier reproducing circuit according to claim 7 or 8, a synchronous detecting apparatus including a circuit (4) to which said I, Q signals are inputted and which determines a predetermined time

15 interval taking said auto-correlation, from said I, Q signals.